

PATENT ABSTRACTS OF JAPAN

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(54) MANUFACTURE FOR ELECTRIC DOUBLE-LAYER CAPACITOR POLARIZED ELECTRODE

(57)Abstract:

PROBLEM TO BE SOLVED: To lower costs by a method wherein, after a mixedly kneaded substance mixedly kneading carbon fine powders, a fluororesin, and molding auxiliaries is molded in a sheet-like manner, the molding auxiliaries in a molded body are removed, and a rolling ratio per one time is set to be a predetermined value % or less, and the rolling is repeated until a prescribed thickness is obtained.

SOLUTION: In this manufacture for an electric double-layer capacitor polarized electrode, carbon fine powders, a fluororesin, and molding auxiliaries are mixedly kneaded to prepare a molding mixedly kneaded substance. Activated carbon, carbon black, or the like is used as the carbon fine powders, and as for an arrangement ratio, the carbon black 1 to 20 is set with respect to activated carbon of 100. Polytetrafluoroethylene, or the like is used as the fluororesin, and the arrangement ratio is set as 1 to 15 with respect to the activated carbon of 100. Water, alcohol, ethyleneglycol, or the like is used as the molding auxiliaries, and the arrangement ratio is set as 50 to 200 with respect to the carbon fine powders of 100. After this mixedly kneaded substance is molded into a sheet-like manner, the molding auxiliaries are removed, and a pressure lowering ratio is set to 40% or less per time rolling in roll rolling, and the rolling is repeated in one direction to form a prescribed thickness.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the manufacture approach of the polarizable electrode for electric double layer capacitors.

[0002]

[Description of the Prior Art] In various kinds of fields, as for current and an electric double layer capacitor, the application development is performed actively. Especially, drastic reduction of the amount of the fossil fuel used by the automobile is called for from the environmental problem and the resource problem, and the so-called hybrid car which can reduce the amount of the fossil fuel used according to concomitant use with a fossil fuel and the electrical and electric equipment is capturing the spotlight as one of the policies of this reduction. In this field, much more high-power-density-ization of the electric double layer capacitor of a high-power-density mold is called for. On the other hand, the use as the so-called backup power supply of a personal computer or various electronic equipment is also increasing. In this field, although the electric double layer capacitor of a high energy consistency mold is used, much more high energy consistency-ization is called for.

[0003] The improvement in the engine performance of a polarizable electrode and reduction of a manufacturing cost aiming at high-performance-izing of an electric double layer capacitor are advanced in order to accept such a request. for example, to JP,7-44127,B, as an approach of manufacturing the polarizable electrode for electric double layer capacitors After preforming carbon impalpable powder, fluorine polymer resin, and the kneading object of a fluid lubrication agent in the shape of a sheet, the method of fabricating a fluid lubrication agent in thickness the whole quantity or predetermined with the reduction roll which carried out specified quantity removal and heated the preforming object subsequently to 40-350 degrees C is indicated.

[0004]

[Problem(s) to be Solved by the Invention] However, the manufacture approach indicated by above-mentioned JP,7-44127,B is set like the roll turner, and where a reduction roll is heated, in order to roll out a sheet-like Plastic solid (preforming object), the control becomes indispensable the top which needs the equipment for heating a reduction roll. For this reason, there was a problem of facility cost having been high, and manufacture condition management having been required, and becoming high cost as a result.

[0005] This invention is made in view of such a conventional situation, it can roll out a sheet-like Plastic solid in ordinary temperature, without heating a reduction roll in the case of [like a roll turner], and does not need the equipment for heating a reduction roll, but aims at offering the manufacture approach of the polarizable electrode for electric double layer capacitors which can be carried out with a simpler facility.

[0006]

[Means for Solving the Problem] According to this invention, after kneading carbon impalpable powder, a fluororesin, and a shaping assistant and fabricating the obtained kneading object in the shape of a

sheet, the shaping assistant in the sheet-like Plastic solid concerned is removed, and manufacture approach ** of the polarizable electrode for electric double layer capacitors characterized by setting up the rolling reduction per time and subsequently to 40% or less rolling out the sheet-like Plastic solid concerned with a reduction roll repeatedly to predetermined thickness is offered.

[0007]

[Embodiment of the Invention] In the manufacture approach of this invention, the kneading object for shaping is first prepared by kneading carbon impalpable powder, a fluororesin, and a shaping assistant. As carbon impalpable powder used for a kneading object, impalpable powder, such as activated carbon and carbon black, can be used. As for activated carbon and the impalpable powder of carbon black, mixing and using is desirable. Activated carbon plays an important role in the improvement in an energy density of a polarizable electrode, and carbon black gives conductivity to a polarizable electrode and contributes to reduction of internal resistance.

[0008] As for the blending ratio of coal of activated carbon and carbon black, it is desirable to consider as carbon black 1 - 20 weight sections to the activated carbon 100 weight section. If the effectiveness of reducing the internal resistance of an electric double layer capacitor to the activated carbon 100 weight section if carbon black is under 1 weight section is small and exceeds 20 weight sections, in order that the mixed rate of activated carbon may decrease, the energy density which can store electricity an electric double layer capacitor falls.

[0009] Polytetrafluoroethylene (PTFE) etc. can be used as a fluororesin. When adding and kneading PTFE as a fluororesin to the carbon impalpable powder which consists of above activated carbon and carbon black, as for the blending ratio of coal of PTFE, it is desirable to consider as 1 - 15 weight section to the activated carbon 100 weight section. If it becomes difficult for the effectiveness as a binder to be small when PTFE is under 1 weight section, and to fabricate a kneading object in the shape of a sheet and 15 weight sections are exceeded to the activated carbon 100 weight section, the internal resistance of an electric double layer capacitor will become large.

[0010] Although the thing of powder and the thing of dispersion exist in PTFE, the thing of powder makes the primary particle of PTFE condense, the aggregated particle is made to form, and the thing of dispersion is making water distribute the primary particle of PTFE generally. The thing of dispersion is [that it is easy to carry out homogeneity distribution] more desirable in case it mixes with carbon impalpable powder to homogeneity.

[0011] Water, alcohol, ethylene glycol, etc. can be used as a shaping assistant. Moreover, a polyethylene glycol etc. can be suitably used as a liquid-preserving agent of a liquefied shaping assistant. When adding and kneading a shaping assistant to the carbon impalpable powder which consists of above activated carbon and carbon black, as for the blending ratio of coal of a shaping assistant, it is desirable to consider as the 50 - 200 weight section to the carbon impalpable powder 100 weight section which consists of activated carbon and carbon black.

[0012] These kneading ingredients are kneaded by a kneader etc. and the obtained kneading object is fabricated in the shape of a sheet. Shaping is performed by the doctor blade method or the extrusion-molding method. The thing high-density as much as possible of the sheet-like Plastic solid acquired with shaping is desirable, and if it carries out from the viewpoint, it can be said that the direction of an extrusion-molding method is the more desirable fabricating method.

[0013] Moreover, it is desirable to make thickness of the sheet-like Plastic solid acquired into about 3 to 20 times of the thickness of a final electrode in this shaping. If the thickness of a sheet-like Plastic solid is less than 3 times of the thickness of a final electrode, extension of the sheet after rolling mentioned later is inadequate, and since the reinforcement of a sheet becomes small, it is not practical. On the other hand, if the thickness of a sheet-like Plastic solid exceeds 20 times of the thickness of a final electrode, a sheet begins to wind, and since the section and the difference [in / it winds and / the boundary section of the section of the end section non-rolled out and the rolling section] of thickness become large, a sheet begins to wind and it becomes easy to produce fracture in said boundary section with the tension at the time and the time of rolling up, it is not practical.

[0014] The shaping assistant contained in a Plastic solid is removed from a sheet-like Plastic solid after

shaping. Removal of a shaping assistant can be carried out by heat-treating a sheet-like Plastic solid at about 100-250 degrees C. For example, it is removable by heat-treating isopropyl alcohol at 200 degrees C as a shaping assistant to the carbon impalpable powder 100 weight section for about 5 hours with the sheet-like Plastic solid acquired from the kneading object which carried out 130 weight sections combination.

[0015] Next, the sheet-like Plastic solid after shaping assistant removal is thin-film-ized to the thickness of the final electrode made into the purpose with roll rolling. Although roll rolling of a sheet-like Plastic solid is performed by passing sheet-like Plastic solid 1 between reduction roll 3a of a pair, and 3b as shown in drawing 1. In this invention, 40% or less, it does not roll out to predetermined thickness at once with the reduction roll heated like before, but it sets up to 30% or less preferably, and the rolling reduction per roll rolling is repeatedly rolled out to an one direction until it becomes predetermined thickness. It is possible for it not to be necessary to cool before rolling the sheet-like Plastic solid from which the shaping assistant was removed for example, and to roll out directly continuously from the heating furnace of continuous system.

[0016] By the way, although a sheet-like Plastic solid is extended in the die-length direction and it goes by such rolling, depending on the conditions of rolling, it may spread in a longitudinal direction. Breadth of this longitudinal direction can be lessened by choosing appropriately the configuration (for example, configuration with a slot) and the diameter of a roll of a reduction roll. Moreover, the count of rolling is decided by the thickness of an early sheet-like Plastic solid, the consistency, the thickness of the polarizable electrode used as a target and a consistency, the diameter of a roll of the reduction roll to be used, etc.

[0017] It can thin-film-ize to the thickness of about 0.10-0.15mm, without doing damage on a crack etc. to a sheet-like Plastic solid, even if the temperature of a reduction roll is room temperature extent if it rolls out by approach like this invention. Therefore, the manufacture approach of this invention does not need the equipment for heating a reduction roll like before, but can carry it out with a simpler facility. In addition, if roll rolling is performed at a room temperature when it sets up so that the rolling reduction per roll rolling may exceed 40%, especially it is the sheet-like Plastic solid by which it becomes impossible for the sheet-like Plastic solid to have followed deformation by rolling, and it was rolled out, in near an edge, it will become easy to generate a crack and a crack, and the good polarizable electrode for electric double layer capacitors will be hard to be obtained.

[0018] Compared with what passed like the roll turner by the reduction roll which the former heated, and was manufactured, the polarizable electrode for electric double layer capacitors manufactured by the manufacture approach of this invention is not inferior in the electrical characteristics, and is equal also in reinforcement.

[0019]

[Example] Hereafter, although this invention is further explained to a detail based on an example, this invention is not limited to these examples.

[0020] (Example) 0.9kg [of carbon impalpable powder] (mixed powder of activated carbon powder and carbon black powder) and polytetrafluoroethylene (PTFE) 0.1kg and ethylene glycol 1.5kg were kneaded for 10 minutes by the kneader. The obtained kneading object was fabricated with the piston type extrusion-molding machine to the sheet-like Plastic solid with a width of face [of 40mm], and a thickness of 3mm, this was heat-treated at 250 degrees C, and ethylene glycol was removed. Next, this sheet-like Plastic solid was rolled out 8 times at 30% of rolling reduction with the roll rolling mill with a roll temperature of 25 degrees C, and the sheet with a thickness of 0.5mm was obtained. Neither the crack nor the crack was accepted in this sheet.

[0021] (Example of a comparison) 0.9kg [of carbon impalpable powder] (mixed powder of activated carbon powder and carbon black powder) and polytetrafluoroethylene (PTFE) 0.1kg and ethylene glycol 1.5kg were kneaded for 10 minutes by the kneader. The obtained kneading object was fabricated with the piston type extrusion-molding machine to the sheet-like Plastic solid with a width of face [of 40mm], and a thickness of 3mm, this was heat-treated at 250 degrees C, and ethylene glycol was removed. Next, this sheet-like Plastic solid was rolled out 3 times at 45% of rolling reduction with the

roll rolling mill with a roll temperature of 25 degrees C, and the sheet with a thickness of 0.5mm was obtained. The crack was accepted in this sheet.

[0022]

[Effect of the Invention] As explained above, according to the manufacture approach of this invention, it is possible to carry out like the roll turner of a sheet-like Plastic solid in ordinary temperature, without heating a reduction roll. Therefore, manufacture of the polarizable electrode for electric double layer capacitors by this invention needs neither the equipment for heating a reduction roll, nor its control, but can be carried out with a simpler facility.

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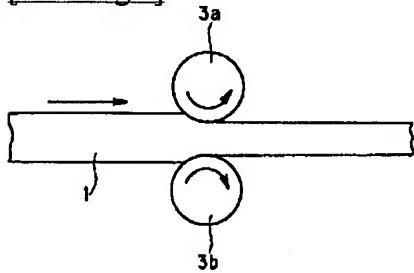
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DRAWINGS

[Drawing 1]



[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the explanatory view in which it is shown like the roll roll turner of a sheet-like Plastic solid.

[Description of Notations]

1 -- A sheet-like Plastic solid, 3a, 3b -- Reduction roll.

[Translation done.]